

CLAIMS

I claim:

1. A method of whitening teeth in a subject, comprising:
applying a first tooth whitening composition to the teeth of the subject for a predetermined period of time; and
applying a second tooth whitening composition to the teeth of the subject in predetermined intervals;
wherein at least one of the first and second tooth whitening compositions is dispensed from a dental delivery device.
2. The method of claim 1, wherein the first tooth whitening composition comprises a first oxidizing agent.
3. The method of claim 2, wherein the first oxidizing agent is selected from the group consisting of hydrogen peroxide, carbamide peroxide, alkali metal peroxides, chlorine dioxide, sodium chlorite, alkali metal percarbonates, and alkali metal perborates.
4. The method of claim 2, wherein the first oxidizing agent comprises hydrogen peroxide in an amount from about 10.0% to about 36.0% weight to weight of the first tooth whitening composition.
5. The method of claim 2, wherein the first oxidizing agent comprises hydrogen peroxide in an amount of about 15.0% weight to weight of the first tooth whitening composition.
6. The method of claim 1, wherein the first tooth whitening composition further comprises a first stabilizer.
7. The method of claim 6, wherein the first stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate,

sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.

8. The method of claim 1, wherein the predetermined period of time ranges from about five minutes to about one hour.
9. The method of claim 1, wherein the second tooth whitening composition comprises a second oxidizing agent.
10. The method of claim 9, wherein the second oxidizing agent is selected from the group consisting of hydrogen peroxide, carbamide peroxide, alkali metal peroxides, chlorine dioxide, sodium chlorite, alkali metal percarbonates, and alkali metal perborates.
11. The method of claim 9, wherein the second oxidizing agent comprises hydrogen peroxide in an amount from about 1.0% to about 10.0% weight to weight of the second tooth whitening composition.
12. The method of claim 9, wherein the second oxidizing agent comprises hydrogen peroxide in an amount of about 5.0% weight to weight of the second tooth whitening composition.
13. The method of claim 1, wherein the second tooth whitening composition further comprises a second stabilizer.
14. The method of claim 13, wherein the second stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate, sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA),

ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.

15. The method of claim 1, wherein the predetermined interval ranges from about one to about six times per day.

16. A method of whitening teeth in a subject, comprising:

applying a first tooth whitening composition to the teeth of the subject for a predetermined period of time; and

providing a second tooth whitening composition to the subject and instructing the subject to apply the second tooth whitening composition in predetermined intervals of time;

wherein at least one of the first and second tooth whitening compositions is dispensed from a dental delivery device.

17. The method of claim 16, wherein the first tooth whitening composition comprises a first oxidizing agent.

18. The method of claim 17, wherein the first oxidizing agent is selected from the group consisting of hydrogen peroxide, carbamide peroxide, alkali metal peroxides, chlorine dioxide, sodium chlorite, alkali metal percarbonates, and alkali metal perborates.

19. The method of claim 17, wherein the first oxidizing agent comprises hydrogen peroxide in an amount from about 10.0% to about 36.0% weight to weight of the first tooth whitening composition.

20. The method of claim 17, wherein the first oxidizing agent comprises hydrogen peroxide in an amount of about 15.0% weight to weight of the first tooth whitening composition.

21. The method of claim 16, wherein the first tooth whitening composition further comprises a first stabilizer.
22. The method of claim 21, wherein the first stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate, potassium stannate trihydrate, sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.
23. The method of claim 16, wherein the predetermined period of time ranges from about five minutes to about one hour.
24. The method of claim 16, wherein the second tooth whitening composition comprises a second oxidizing agent.
25. The method of claim 24, wherein the second oxidizing agent is selected from the group consisting of hydrogen peroxide, carbamide peroxide, alkali metal peroxides, chlorine dioxide, sodium chlorite, alkali metal percarbonates, and alkali metal perborates.
26. The method of claim 24, wherein the second oxidizing agent comprises hydrogen peroxide in an amount from about 1.0% to about 10.0% weight to weight of the second tooth whitening composition.
27. The method of claim 24, wherein the second oxidizing agent comprises hydrogen peroxide in an amount of about 5.0% weight to weight of the second tooth whitening composition.
28. The method of claim 16, wherein the second tooth whitening composition further comprises a second stabilizer.

29. The method of claim 28, wherein the second stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate, potassium stannate trihydrate, sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.
30. The method of claim 16, wherein the predetermined interval ranges from about one to about six times per day.
31. A kit for whitening teeth in a subject, comprising:
- a first tooth whitening composition comprising from about 10.0% to about 36.0% hydrogen peroxide weight to weight of the first tooth whitening composition;
 - a second tooth whitening composition comprising from about 1.0% to about 10.0% hydrogen peroxide weight to weight of the second tooth whitening composition;
 - a dental delivery device configured to dispense the second tooth whitening composition; and
 - a set of instructions.
32. The kit of claim 31, wherein the hydrogen peroxide is present in an amount of about 15.0% weight to weight of the first tooth whitening composition.
33. The kit of claim 31, wherein the first tooth whitening composition further comprises a first stabilizer.
34. The kit of claim 33, wherein the first stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate,

potassium stannate trihydrate, sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.

35. The kit of claim 31, wherein the first tooth whitening composition further comprises a thickener.

36. The kit of claim 35, wherein the thickener is selected from the group consisting of carboxypolymethylene, polyacrylic acid polymers and copolymers, hydroxypropylcellulose, cellulose ethers, salts of poly(methyl vinyl ether-co-maleic anhydride), polyvinyl pyrrolidone, poly(vinylpyrrolidone-co-vinyl acetate), silicon dioxide, fumed silica, and stearic acid esters.

37. The kit of claim 31, wherein the first tooth whitening composition further comprises a first alkaline pH adjusting agent.

38. The kit of claim 37, wherein the first alkaline pH adjusting agent is selected from the group consisting of sodium hydroxide, potassium hydroxide, ammonium hydroxide, sodium carbonate, potassium carbonate, sodium phosphate di- and tri-basic, potassium phosphate di- and tri-basic, sodium tripolyphosphate, tris(hydroxymethyl)aminomethane, triethanolamine, and polyethylenimine.

39. The kit of claim 31, wherein the first tooth whitening composition further comprises a first secondary therapeutic agent selected from the group consisting of antimicrobial agents, anti-inflammatory agents, tooth desensitizers, anticaries agents, tartar control agents, tooth and gum surface protectants, tooth stain prevention agents and agents effective against dental plaque, halitosis, gingivitis, periodontal disease, oral ulcers and other diseases, afflictions or symptoms of the oral cavity.

40. The kit of claim 31, wherein the hydrogen peroxide is present in an amount of about 5.0% weight to weight of the second tooth whitening composition.
41. The kit of claim 31, wherein the second tooth whitening composition further comprises a second stabilizer.
42. The kit of claim 41, wherein the second stabilizer is selected from the group consisting of 1-hydroxyethylidene-1,1-diphosphonic acid, sodium stannate trihydrate, sodium acid pyrophosphate, ethylenediamine tetraacetic acid (EDTA), diethylenetriamine pentaacetic acid (DETPA), nitrilotriacetic acid (NTA), ethylenediamine tetra(methylenephosphonic acid), diethylenetriamine penta(methylenephosphonic acid), sorbitol, xylitol, mannitol, maltitol, lactitol, alkali metal pyrophosphates and alkali metal polyphosphates.
43. The kit of claim 31, wherein the second tooth whitening composition further comprises a second alkaline pH adjusting agent.
44. The kit of claim 43, wherein the second alkaline pH adjusting agent is selected from the group consisting of sodium hydroxide, potassium hydroxide, ammonium hydroxide, sodium carbonate, potassium carbonate, sodium phosphate di- and tri-basic, potassium phosphate di- and tri-basic, sodium tripolyphosphate, tris(hydroxymethyl)aminomethane, triethanolamine, and polyethylenimine.
45. The kit of claim 31, wherein the second tooth whitening composition further comprises a second secondary therapeutic agent selected from the group consisting of antimicrobial agents, anti-inflammatory agents, tooth desensitizers, anticaries agents, tartar control agents, tooth and gum surface protectants, tooth stain prevention agents and agents effective against dental plaque, halitosis, gingivitis, periodontal disease, oral ulcers and other diseases, afflictions or symptoms of the oral cavity.

46. The kit of claim 31, wherein the second tooth whitening composition further comprises a moisture responsive gel carrier.
47. The kit of claim 46, wherein the moisture responsive gel carrier comprises from about 80.0% (w/w) to about 99.99% (w/w) of the second tooth whitening composition.
48. The kit of claim 46, wherein the moisture responsive gel carrier comprises a moisture sensitive polymer complex, water, and a water soluble salt.
49. The kit of claim 48, wherein the moisture sensitive polymer complex comprises carboxypolymethylene and polyvinylpyrrolidone.
50. The kit of claim 48, wherein the water soluble salt is selected from the group consisting of sodium saccharin, sodium chloride, potassium chloride, and ammonium chloride.
51. The kit of claim 48, wherein the moisture sensitive polymer complex is present in an amount of about 0.01% (w/w) to about 50.0% (w/w) of the composition.
52. The kit of claim 48, wherein the moisture sensitive polymer complex is present in an amount of about 0.01% (w/w) to about 10.0% (w/w) of the composition.
53. The kit of claim 31, wherein the dental delivery device comprises:
an applicator for applying the first tooth whitening composition to the tooth surface;
an actuator; and
a reservoir located between the applicator and the actuator and configured to store the first tooth whitening composition,
wherein the actuator is configured to dispense the first tooth whitening composition from the reservoir to the applicator.
54. The kit of claim 31, wherein the dental delivery device comprises:

an applicator for applying the second tooth whitening composition to the tooth surface;

an actuator; and

a reservoir located between the applicator and the actuator and configured to store the second tooth whitening composition,

wherein the actuator is configured to dispense the second tooth whitening composition from the reservoir to the applicator.

55. The kit of claim 53 or 54, wherein the applicator is selected from the group consisting of a brush, a felt tip, a roller ball, and a non-woven pad.

56. The kit of claim 53 or 54, wherein the actuator is selected from the group consisting of a click mechanism, a twist and ratchet mechanism, and a push button.

57. The kit of claim 53 or 54, wherein the applicator comprises a brush and the actuator comprises a push button, wherein the push button dispenses the composition to the brush applicator.

58. The kit of claim 53 or 54, wherein the applicator comprises a brush and the actuator comprises a twist mechanism, wherein the twist mechanism dispenses the composition to the brush applicator.

59. The kit of claim 53 or 54, wherein the applicator comprises a felt tip and the actuator comprises a push button, wherein the push button dispenses the composition to the felt tip applicator.

60. The kit of claim 53 or 54, wherein the applicator comprises a felt tip and the actuator comprises a twist mechanism, wherein the twist mechanism dispenses the composition to the felt tip applicator.

61. A two component tooth whitening system, comprising:
a first tooth whitening composition comprising
from about 10.0% to about 36.0% hydrogen peroxide weight to weight
of the first tooth whitening composition; and
from about 64.0% to about 90.0% carrier weight to weight of the first
tooth whitening composition; and
a second tooth whitening composition comprising
from about 1.0% to about 10.0% hydrogen peroxide weight to weight
of the second tooth whitening composition; and
from about 90.0% to about 99.0% moisture responsive gel carrier
weight to weight of the second tooth whitening composition.
62. A liquid oral therapeutic dental composition, that increases in viscosity upon
contact with moisture following application to an oral cavity surface, comprising:
a moisture responsive gel carrier comprising a moisture sensitive polymer
complex and a water-soluble salt; and
a therapeutic agent dispersed in the responsive gel carrier.
63. The composition of claim 62, wherein the moisture responsive gel carrier
further comprises a thermally responsive polymer.
64. The composition of claim 62, wherein the moisture responsive gel carrier
further comprises a pH or ion responsive polymer.
65. The composition of claim 62, wherein the therapeutic agent is selected from
the group consisting of antimicrobial agents, tooth whiteners, anti-inflammatory
agents, tooth desensitizers, anticaries agents, tartar control agents, tooth and gum
surface protectants, tooth stain prevention agents and agents effective against dental

plaque, halitosis, gingivitis, periodontal disease, oral ulcers and other diseases, afflictions or symptoms of the oral cavity.

66. The composition of claim 62, wherein the therapeutic agent comprises a tooth whitener.

67. The composition of claim 66, wherein the tooth whitener is selected from the group consisting of an alkali metal percarbonate, carbamide peroxide, sodium perborate, potassium persulfate, calcium peroxide, zinc peroxide, chlorine dioxide, sodium chlorite, a hydrogen peroxide complex, hydrogen peroxide and mixtures of any of the foregoing.

68. The composition of claim 66, wherein the tooth whitener comprises about 0.01% (w/w) to about 20.0% (w/w) of hydrogen peroxide.

69. The composition of claim 66, wherein the tooth whitener comprises about 2.0% (w/w) to about 30.0% (w/w) of carbamide peroxide.

70. The composition of claim 62, further comprising water present in an amount of about 10.0% (w/w) to about 98.7% (w/w) of the composition.

71. The composition of claim 62, wherein the moisture responsive gel carrier comprises from about 80.0% (w/w) to about 99.99% (w/w) of the composition.

72. The composition of claim 62, wherein the moisture sensitive polymer complex comprises carboxypolymethylene and polyvinylpyrrolidone.

73. The composition of claim 62, wherein the water soluble salt is selected from the group consisting of sodium saccharin, sodium chloride, potassium chloride, and ammonium chloride.
74. The composition of claim 63, wherein the temperature sensitive polymer comprises methylcellulose.
75. The composition of claim 63, wherein the temperature sensitive polymer comprises hydroxypropyl methylcellulose.
76. The composition of claim 63, wherein the temperature sensitive polymer comprises a poly(oxyethylene)-poly(oxypropylene) block copolymer.
77. The composition of claim 62, wherein the moisture sensitive polymer complex is present in an amount of about 0.01% (w/w) to about 50.0% (w/w) of the composition.
78. The composition of claim 62, wherein the moisture sensitive polymer is present in an amount of about 0.01% (w/w) to about 10.0% (w/w) of the composition.
79. A therapeutic dental delivery device for treating a condition in an oral cavity of a subject, comprising:
- a liquid oral therapeutic dental composition;
 - an applicator for applying the composition to the oral cavity;
 - an actuator; and
 - a reservoir located between the applicator and the actuator and configured to store the composition,

wherein the actuator is configured to dispense the composition from the reservoir to the applicator.

80. The device of claim 79, wherein the therapeutic dental composition comprises a moisture responsive gel carrier and a therapeutic agent dispersed in the moisture responsive gel carrier.

81. The device of claim 80, wherein the moisture responsive gel carrier comprises a moisture sensitive polymer complex and a water soluble salt.

82. The device of claim 79, wherein the applicator is selected from the group consisting of a brush, a felt tip, a roller ball, and a non-woven pad.

83. The device of claim 79, wherein the actuator is selected from the group consisting of a click mechanism, a twist and ratchet mechanism, and a push button.

84. The device of claim 79, wherein the applicator comprises a brush and the actuator comprises a push button, wherein the push button dispenses the composition to the brush applicator.

85. The device of claim 79, wherein the applicator comprises a brush and the actuator comprises a twist mechanism, wherein the twist mechanism dispenses the composition to the brush applicator.

86. The device of claim 79, wherein the applicator comprises a felt tip and the actuator comprises a push button, wherein the push button dispenses the composition to the felt tip applicator.

87. The device of claim 79, wherein the applicator comprises a felt tip and the actuator comprises a twist mechanism, wherein the twist mechanism dispenses the composition to the felt tip applicator.
88. The device of claim 81, wherein the moisture sensitive polymer complex comprises carboxypolymethylene and polyvinylpyrrolidone.
89. The device of claim 80, wherein the therapeutic agent comprises a peroxide.
90. The device of claim 80, wherein the therapeutic agent comprises hydrogen peroxide.
91. The device of claim 80, wherein the therapeutic agent comprises carbamide peroxide.
92. The device of claim 79, wherein the composition is present in an amount of from about 0.01 ml to 1.0 ml.
93. A therapeutic dental pen for treating a condition in an oral cavity of a subject, comprising:

a liquid oral therapeutic dental composition comprising a moisture responsive gel carrier and a therapeutic agent dispersed in the responsive gel carrier, wherein the gel carrier comprises a polymer complex including carboxypolymethylene and polyvinylpyrrolidone and a water soluble salt;

a brush-on applicator for applying the composition to the oral cavity;

a push button; and

a reservoir located between the applicator and the push button and configured to store the composition,

wherein the push button is configured to dispense the composition from the reservoir to the applicator.

94. The pen of claim 93, wherein the therapeutic agent comprises a peroxide.

95. The pen of claim 93, wherein the therapeutic agent comprises hydrogen peroxide.

96. The pen of claim 93, wherein the therapeutic agent comprises carbamide peroxide.

97. A dental therapeutic kit comprising:

a liquid oral therapeutic dental composition comprising a moisture responsive gel carrier and a therapeutic agent;

a delivery device comprising:

an applicator for applying the composition to the oral cavity;

an actuator; and

a reservoir located between the applicator and the actuator and

configured to store the composition, wherein the actuator is configured

to dispense the composition from the reservoir to the applicator; and

a set of instructions.

98. A method for whitening teeth of a subject in need thereof, comprising:

providing a therapeutic dental composition comprising a moisture responsive gel carrier and a therapeutic agent dispersed in the responsive gel carrier, wherein the gel carrier comprises a polymer complex including carboxypolymethylene and polyvinylpyrrolidone and a water soluble salt; and

applying the composition to a tooth of the subject.

99. A method of whitening teeth in a subject, comprising:

applying a tooth whitening composition to the teeth of the subject with a device comprising:

an applicator for applying the tooth whitening composition to the oral cavity;

an actuator; and

a reservoir located between the applicator and the actuator and configured to store the composition,

wherein the actuator is configured to dispense the composition from the reservoir to the applicator through a transport channel.

100. The method of claim 99, wherein the device comprises plastic.

101. The method of claim 99, wherein the components of the device that are in contact with the tooth whitening composition comprise a plastic coating.